A Synopsis of thesis entitled

Studies on Spatial Ecology of Freshwater Crabs from Godavari River Basin: Implications for Conservation and Management

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Submitted By
Pawde Uttam Dileeprao

Under Supervision of
Dr. Ravi D. Barde.
Research Supervisor,
Department of Zoology,
Shri Guru Buddhiswami Mahavidyalaya,Purna
Dist.: Parbhani-431511

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1.Introduction

Crabs are found in all of the world's oceans, as well as in fresh water and on land, particularly in tropical regions. About 850 species are freshwater crabs. Crabs are, omnivores, feeding primarily on algae and taking any other food, including molluscs, crustaceans, fungi, worms, other bacteria, and detritus, depending on their availability and the crab species. Crab Cultivation became an option to fishery due to nutrition value. Crabs are an important source of food, little is known about crabs on the west coast of India. Information on the diversity of these fascinating creatures is confined to crabs collected from sandy beaches, rocky foreshores, mud flats, marshes and mangrove swamps. Crabs play an important role in recycling nutrients in an ecosystems. They are a prime source of food for various fish, (including stingrays), frogs, crocodiles, swimming and wading birds, jackals and other carnivores. They are important scavengers of the seashore, making up in numbers what they lack in size. Despite their ecological importance, crabs are often treated as a nuisance. They burrow actively, causing considerable damage to canal and river banks and pond bunds. This can cause heavy losses to commercial aquaculture.

Crabs from freshwater habitats are among the most significant invertebrates found in the waterways of the Indian subcontinent, and they can be found in nearly all freshwater habitats, including mountain streams, huge lowland rivers, and smaller bodies of water (Bahir and Yeo, 2007). Due to their function in the nitrogen cycle, the monitoring of water quality, and small-scale fishing, freshwater crabs are significant both ecologically and commercially. One-fifth of the known brachyuran variety, or 1280 species, are found worldwide under four super families (Cumberlidge et al., 2009). We describe 96 species, grouped into 41 genera and 6 families, that have been previously identified as occurring in India (Wood-Mason, 1871; Henderson, 1893; Alcock, 1910; Bott, 1970; Bahir and Yeo, 2005, 2007 and Ng *et al*., 2011).

Five species make up the *Sesarmidae, Varunidae,* and *Hymenosomatidae* families, each of which has members that are either marine or estuarine in type. Some members of these families, however, have developed the necessary adaptations to survive in freshwater habitats and complete their life cycles there, eliminating the need to travel back to the sea (Ng, 1988). These have been regarded as freshwater species as a result. Freshwater is the habitat of every species in the genus Gecarcinucidae.

Keeping crabs in their natural habitat is the best approach to conserve them. Some species that are significant for commerce can be found in mudflats, riverbanks, and sandy beaches. By reducing erosion, growing trees across the river banks, and preserving sand dunes, these ecosystems can be safeguarded, as can associated habitats like mangroves.

2. Review of literature & Development in the subject:

The past few decades has seen an upsurge of interest in the using freshwater crabs as ecological model for assessing impact of various environmental stress and pollutant in the rivers (Jadhav, et al. 2011). A number of studies have showed that various chemical pollutant and pesticides have affected the population structure of the crabs in the Godavari basin (Venugopal, et al. 1997). This has resulted in a steep decrease in the populations of the crabs in the region (Thankar, 1985). The knowledge on diversity and distribution of freshwater crabs in the Godavari river basin is limited due to lower sampling efforts and inaccessibility to remote localities in general.

3. Objective of Research/ Proposed Hypothesis:

The diversity of freshwater crabs may be abundant in Godavari River basin in Nanded district. The present work aimed at finding diversity in Crab population in this region.

Objective includes:

1) To determine the diversity of Crabs in this region.
2) To Investigate new species is present in Godavari basin of Nanded district.
3) To quantify the movement patterns, spawning site fidelity, and seasonal habitat use of mature crabs within and between different areas.
4) To determine the migration of crabs from the river basins to other areas.

4. Methodology to be adopted:

Monthly samplings will be carried out between January 2023 and 2027. With the help of two persons, the animals will be manually captured for 40 minutes. After that, the crabs will be transported to a facility where they will be recognised, divided by sex, measured, and have their gonads macroscopically examined. Three collections will be made for the histological analysis of gonads from 2023 to 2027. Both the main Godavari River basin and its tributaries will provide

samples. In both the main Godavari River basin and its tributaries, the frequency of size classes for males and females will be distributed throughout the year((Barde et al., 2021).).

The pre-molt, recent post-molt, and advanced post-molt periods of the caught crabs' moults will be identified. The major Godavari River basin and its tributaries' reproductive cycle will be identified. For the eggs, the average fecundity in the main Godavari River basin and its tributaries will be calculated. The stages of gonadal development for males (Immature and mature) and females (Immature, in development, mature, and pawned) will be identified.

5. Importantance of Study/ Society application.

a) International Status.

A review of the diversity of freshwater crabs worldwide is given. There are currently 1,476 species in 14 families from all zoogeographical regions (aside from Antarctica) known, including 1,306 species in eight families that are only known to exist in freshwater: *Pseudothelphusidae, Trichodactylidae, Deckeniidae, Platythelphusidae, Potamidae, Gecarcinucidae,* and *Parathelphusidae*. Estimates of the true diversity of freshwater crabs, which take into account the probable numbers of undiscovered taxa, indicate that the field is still primarily in the "discovery" stage. These crabs exhibit significant degrees of geographic endemism (84%) to both South Africa (74%), as well as the southern African region. Based on thorough collections of the majority of known specimens, the IUCN (2003) Red List criteria are used to evaluate each species' conservation status.

The conservation of freshwater crabs depends primarily on preservation of areas of natural habitat large enough to maintain water quality. Although it is not yet known exactly how sensitive the freshwater crabs are to polluted or silted waters, there is evidence that crabs are not likely to survive when exposed to these factors.

The preservation of natural habitat areas that are sufficiently large to sustain water quality is essential for freshwater crab conservation. Although the freshwater crabs' sensitivity to dirty or muddy waters is not yet fully understood, there is evidence to suggest that they are unlikely to survive if exposed to these conditions.

In an effort to comprehend the mechanisms causing evolutionary change over time, population genetics is the study of genetic variation within and between species (Hartl and Clark, 1997).

Because it is the engine of evolution, genetic variety within species is significant. Population genetics makes an effort to comprehend the mechanisms underlying changes in allele frequencies, the organisation of genetic diversity, and the causes of genetic variation and patterns. (Conner and Hartl, 2004). Understanding a species' evolutionary history and processes can be achieved by examining the patterns of genetic variation that exist within that species. By examining the population structure of the species, it is possible to explore these patterns of genetic diversity in an organism.

b) National Status.

Many species discovered in the region lack sufficient data, and significant portions of this large and biodiverse region remain unexplored. If collection efforts in isolated locations are stepped up and taxonomic breakthroughs are made more accessible in the form of identification keys, new species of freshwater crabs will undoubtedly be found. India is recognised as a nation with a rich biodiversity (Barde et al., 2020). Although taxonomic knowledge has advanced considerably recently, and museum collections of freshwater crabs have improved, a great deal of work still needs to be done. (Srivastava, 2005) There is a need for further study and surveys to study species distributions, define specific habitat requirements, describe population levels and trends, and identify specific threats to important and unique freshwater crab. It is vital to the health of these ecosystems that consider measures that specifically include the conservation and sustainable use of local populations of river crabs. The biology and distribution patterns of the freshwater crabs are becoming better known for the potential threats to their long-term survival (Venkateshwarlu and Sunita 1995).

Many of the freshwater crabs are excellent indicators of good water quality (Yeo et al., 2008). Freshwater crabs are highly endemic due to their limited dispersal ability, low fecundity and selected habitat preference (Pati & Sharma, 2012a). Out of 1476 species (1306 exclusively freshwater species) of freshwater crabs (Yeo et al., 2008), India is having about 96 species (91 exclusively freshwater species) (Pati et al., 2012) and few more new species are yet to be described by them besides a recently described species from Odisha state (Pati & Sharma, 2012b). Taxonomical status of some Indian species is uncertain (Bahir & Yeo, 2005, 2007). Due to their ecological and economical importance, a systematic study was conducted on freshwater crabs present in National Zoological Collections (NZC) of Western Regional Centre (WRC), Zoological Survey of India (ZSI), Pune.

c) Significance of the Study.

Zoological Survey of India collecting and conserving the data on different species among them Crab diversity study is one of the important aspects. The Red List maintained by the IUCN has indicated that freshwater crabs e.g. *Barytelphusa guerini* has come under least concerned animal in view of its wide distribution, presumed large population, and because it is unlikely to be declining fast enough to qualify for listing in a more threatened category. The future threats to this species include human induced habitat loss/degradation due to population increases and industrial and agrarian development (Cumberlidge, 2008). Thus, this study on the population and ecological studies can lead to steps toward conservation of this species.

7. Proposed work Plan/Formulation and Structure of Study:

First year (2024-2025)

1. Survey of the region for the various tributaries and spots in Godavari basin inhabited by the freshwater crabs.
2. Mapping of samples for the study of population structure and reproductory aspects of the crab
3. Study of ecological aspect of the crab population in the basin.

Second year (2025-2026)

1. Study of population structure of the crab and compilation of the data
2. Study on migration and tagging of animal for tracing migration.
3. Collection of tissue samples for molecular studies

Third year (2026-2027)

1. Study of reproductive aspects of the crab and analysis of the data
2. Molecular study of the DNA samples collected over the period.
3. Analysis and Compilation of work

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(Pawde Uttam Dileeprao)
Research Scholar

(Ravi D. Barde)
Research Supervisor